"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.M.; SEDOVA, T.V.

Variability of the taxonomic characters of unicellular green algae in culture. Report No.1. Disappearance of the pyrenoid. Bot.zhur. 50 no.7:954-961 Jl '65.

(MIRA 18:11)

1. Botanicheskiy institut imeni Komarova AN SSSR, Leningrad.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

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ANDREYEVA, V.N.

5

The decomposition potentials of metallic oxide in fused phosphates. V. N. Andreeva (V. I. Lenin Polytech. Inst., Kiev). *Ukrain. Khim. Zhur.* 21, 509–15(1955).—The decompn. potentials of fused Na meta- and pyrophosphates were detd. by the construction of *I-V* curves. Two decompn. potentials were found for each of the phosphates, which proved complex-ion formation in these phosphates. The decompn. potentials of ZnO, WO_3, CdO, PbO, CaO, Fe_2O_3, NiO, CuO, MoO_3, Bi_2O_3, and Sb_2O_3 dissolved in fused $NaPO_3$ and in $Na_4P_2O_7$ were detd. The electrochem. series of metals in the fused phosphates were calcd. from the decompn.-potential values. At 1000°, the series in $NaPO_3$ was Na, Zn, W, Cd, Pb, Co, Fe, Ni, Mo, Bi, Sb, and in $Na_4P_2O_7$, Na, Zn, W, Cd, Co, Ni, Cu, Pb, Fe, Mo, Sb. The authenticity of the series was confirmed by the detn. of e.m.f. of the corresponding Jacoby-Daniell cells. The differences in the 2 series of potentials in $NaPO_3$ and in $Na_4P_2O_7$ proved the formation of different compds. in the interaction of the oxides with the 2 phosphates. The existence of several inflections on some of the *I-V* curves was assumed to have resulted from the decompn. of some more complex forms at high temps. W. M. Sternberg

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

21-58-7-14/27

AUTHORS: Delimarskiy, Yu.K., Member of the AS UkrSSR, and Andreyeva, V.N.

TITLE: Galvanic Concentration Cells in Fused Phosphates (Gal'vanicheskiye kontsentratsionnyye elementy v rasplavlennykh fosfatakh)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 7, pp 743-746 (USSR)

ABSTRACT: The authors investigated concentration cells composed of a solution of Sb_2O_3 in the fused sodium metaphosphate. One of the semi-elements was pure antimony oxide and the other was the fused sodium metaphosphate in which the Sb_2O_3-concentration was variable. The electromotive forces of these cells were measured, the activity and activity coefficients of Sb_2O_3 were calculated, and their dependence on the concentration was established. The results are presented in a table and in graphs. In one of the graphs, Fig. 1, electromotive force E is plotted versus $\lg\frac{1}{N}$ where N means concentration, and in the other two concentrations, N is plotted versus activity and activity coefficient respectively. On the basis of the E, $\lg\frac{1}{N}$ - curve the authors

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Galvanic Concentration Cells in Fused Phosphates

come to the conclusion that compounds of the antimony oxy-polyphosphate type are formed in the investigated system, thereby confirming an inference drawn by Bues and Gehrke (Ref. 12) on the basis of optical studies with respect to sodium polyphasphate. There is 1 table, 3 graphs, and 12 references, 4 of which are Soviet, 4 German, 1 French and 3 American.

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN UkrSSR (Institute of General and Inorganic Chemistry of the AS UkrSSR)

SUBMITTED: February 4, 1958

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration.

1. Phosphates--Electrical properties 2. Antimony oxides--Electrochemistry 3. Electrolytic cells--Theory

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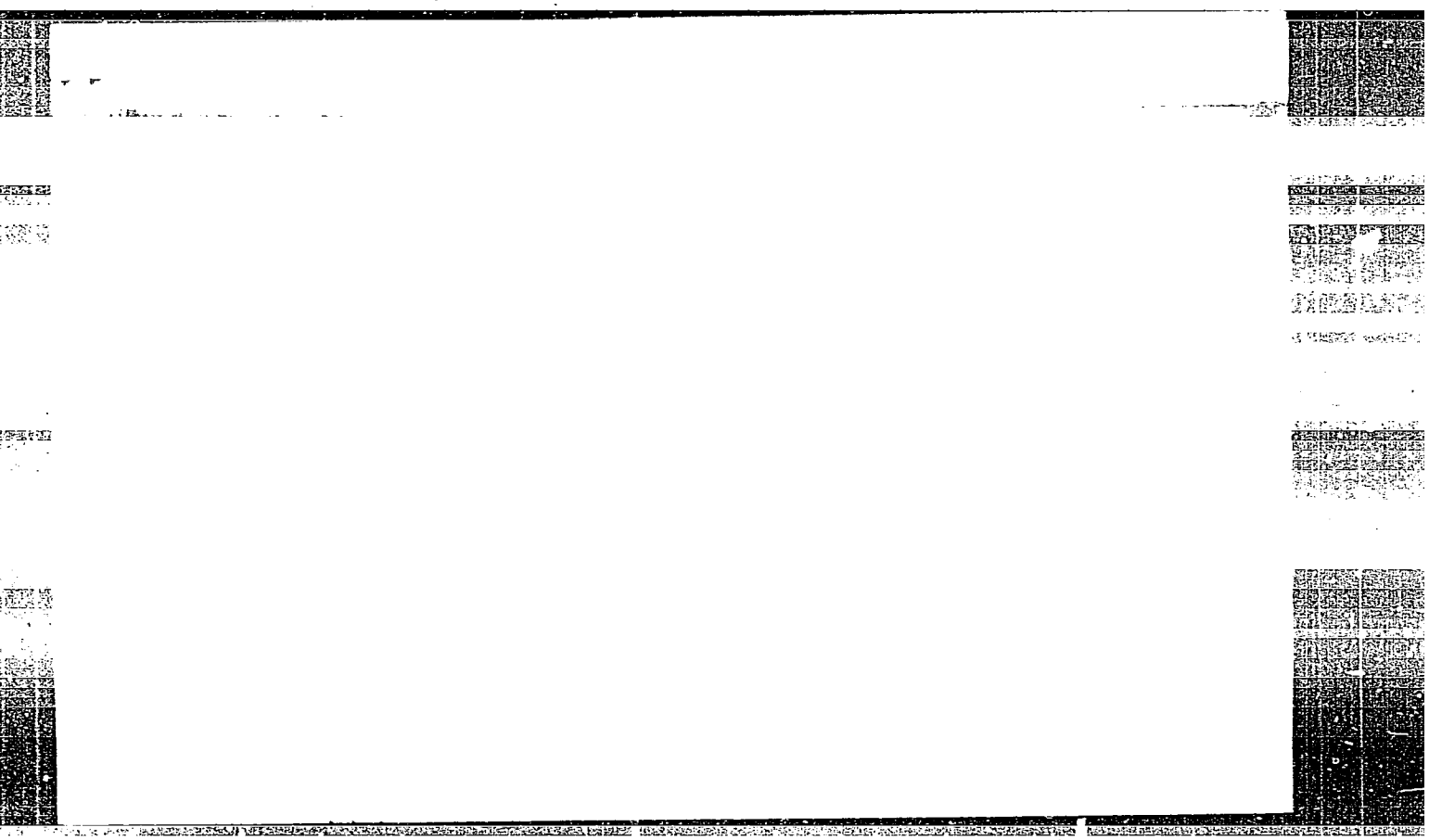

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

(SOV/21-59-6-14/27

AUTHORS: Delimarskiy, Yu. K., Academician of the AS UkrSSR, and Andreyeva, V. N.

TITLE: Potentiometric Determination of the Solubility of Metal Oxides in Fused Sodium Metaphosphate

PERIODICAL: Dopovidi Akademii Nauk Ukrains'koi RSR, 1959, Nr 6, pp 633 - 635 (USSR)

ABSTRACT: Having rejected the determination of the solubility of metal oxides in fused salts by the method of isothermic saturation as ill-fitted to deal with colorated fused solvents, the author studied this matter applying the potentiometric method described by H. Lux [Ref. 4] . At the same time, the author had an objective to disprove the Lux's statement, that CaO can be dissolved in a fused eutectic Na_2SO_4 - K_2SO_4 only when the electrolytic dissociation is complete. The author constructed a galvanic cell of Pt (O_2) / $NaPO_3$-PbC// $NaPO_3$/ (O_2) Pt type, and applied the indicator platinum-oxygen

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

Potentiometric Determination of the Solubility of Metal Oxides in Fused Sodium Metaphosphate

electrode consisting of 0.5 mm platinum wire encased in a porcelain cover. In the galvanic cell, the author used two crucibles of different dimensions, made of porcellain. The larger crucible contained $NaPO_3$, the smaller (put into the larger one) $-NaPO_3$-PbO, with different concentrations of PbO. Electromotive force was measured by a PPTV potentiometer. The element was heated in an electric furnace, at an even temperature of 720°C. Results of examinations are compiled in tables 1 and 2. It has been found that the electromotive force grew with the growth of oxide concentration. This confirmed the correctness of the author's assumption, and proved the reversibility of platinum electrode with respect to oxygen iones. The saturated solution obtained by this method contained 31.6% PbO, which agreed satisfactorily with the value of 31.0% obtained by the method of isothermal saturation. The proposed method can also be applied to other oxides.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

SOV/21-59-6-14/27

Potentiometric Determination of the Solubility of Metal Oxides in Fused Sodium Metaphosphate

There are 2 tables, 1 graph and 9 references, 4 of which are Soviet, 2 German and 3 English

ASSOCIATION: Institut obshchey i neorganicheskoy khimii AN UkrSSR (Institute of General and Inorganic Chemistry of the AS UkrSSR)

SUBMITTED: Januar 14, 1959

Card 3/3

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

5(2) SOV/21-59-7-15/25

AUTHOR: Delimars'kyy, Yu.K., Member of the AS UkrSSR and Andryeyeva, V.M. (Delimarskiy, Yu. K. and Andreyeva, V. N.)

TITLE: Chemical Galvanic Cells in Fused Phosphate Systems

PERIODICAL: Dopovidi Akademii Nauk Ukrains'koi RSR, 1959, Nr 7, pp 760-765 (UkrSSR)

ABSTRACT: The authors investigated and demonstrated the reproducibility and reversibility of a platinum-oxygen electrode in fused sodium metaphosphate. The presence of such an electrode permits measuring the e.m.f. of chemical cells for metal oxide solutions in fused metaphosphate. The chemical cell e.m.f.'s were measured with a mixed electrolyte, PbO - $NaPO_3$, in dependence on the temperature and composition. On the basis of these values, the partial excessive thermodynamic functions (isobaric potential, entropy, enthalpy) were calculated for various concentrations of PbO. The thermodynamic properties of lead oxide dissolved in sodium metaphosphate indicate that there

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Chemical Galvanic Cells in Fused Phosphate Systems

is a strong chemical interaction among the melt components. Evidence of this is found in the magnitudes of the partial entropy values, as well as in the considerable negative deviations of the isobaric potential. There are 3 tables, 3 diagrams and 6 references, 2 of which are Soviet and 4 American

ASSOCIATION: Instytut zahal'noyi ta neorhanichnoyi khimiyi AN URSR (Institute of General and Inorganic Chemistry AS UkrSSR)

SUBMITTED: February 16, 1959

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K.; ANDREYEVA, V.N.

Galvanic concentration of elements in fused phosphates. Part 1: Antimony oxide in sodium metaphosphate. Ukr.khim.zhur. 25 no.1: 8-13 '59. (MIRA 12:4)

1. Kiyevskiy politekhnicheskiy institut.
(Antimony oxides) (Sodium phosphates)
(Electrochemistry)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYeVA, V. N., Cand Chem Sci -- (diss) "Electrochemical investigation of dissolved phosphates," Kiev, 1960, 13 pp. 150 cop. (Kiev State U im T. G. Shevchenko) (KL, 45-60, 122)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K.; ANDREYEVA, V.N.

Potentiometric determination of the solubility of metal oxides in fused sodium metaphosphate. Zhur.neorg.khim. 5 no.5:1123-1125 My '60. (MIRA 13:7)
(Metallic oxides) (Sodium metaphosphate)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K.; ANDREYEVA, V.N.

Thermodynamic properties of lead oxide dissolved in fused sodium metaphosphate. Zhur. neorg. khim. 5 no.8:1800-1805 Ag '60. (MIRA 13:9)

(Lead oxide) (Sodium metaphosphate)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

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85600

S/078/60/005/009/034/040/XX
B017/B058

5.4700 2205, 1018, 1273

AUTHORS: Andreyeva, V. N., Delimarskiy, Yu. K.

TITLE: The Thermodynamic Properties of Some Metal Oxides Dissolved in Molten Sodium Metaphosphate

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 9, pp. 2076 - 2083

TEXT: The oxides of bismuth, nickel, molybdenum, and antimony were dissolved in molten $NaPO_3$. Chemical electrolyte chains were formed from these solutions and their emf was determined in dependence on temperature and composition of the electrolyte. The thermodynamic functions (isobaric potential, entropy and enthalpy) as well as the activities and the coefficients of activity were calculated for Bi_2O_3 and NiO on the basis of the results obtained. The emf of the chemical chain $Bi|Bi_2O_3|O_2(Pt)$ and the emf of the chemical chain $Bi|NaPO_3 \cdot Bi_2O_3(N)|O_2(Pt)$ are given in Tables 1 and 2. Fig. 1 shows the dependence of the emf in the system

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The Thermodynamic Properties of Some Metal Oxides Dissolved in Molten Sodium Metaphosphate

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B017/B058

Bi_2O_3 - $NaPO_3$ on the molar ratio of both components. The dependence ΔZ_{excess} N on the molar ratio can be seen in Fig. 2. The thermodynamic characteristics of the Bi_2O_3 - $NaPO_3$ system in dependence on the molar ratio are summarized in Table 3. Table 4 shows the activity of Bi_2O_3 in the Bi_2O_3 - $NaPO_3$ system at 860°C. The experimental and calculated emf values given in Table 5 differ only slightly. The same studies were also made for the NiO - $NaPO_3$ system, and the results are given in Tables 7 and 8 and in Figs. 3 to 5. The thermodynamic data and the activity coefficients point towards an intensive chemical interaction of the bismuth and nickel oxides with $NaPO_3$. The emf determination of the chemical chains $Mo|MoO_3|O_2(Pt)$ and $Mo|NaPO_3 - MoO_3(N)|O_2(Pt)$ shows that a reduction of hexavalent molybdenum sets in in this system, and compounds of lower valency form. The emf values of the chain $Mo|NaPO_3 - MoO_3(N)|O_2(Pt)$ at temperatures of from 720 to 900°C are given

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDRE YEVH, V. N.

report to be submitted for the IUPAC 21st Conference and 13th Intl. Congress of Pure and Applied Chemistry, Montreal, Canada, 2-12 August 1961

ALIMARIN, I. P., and ZOLOTOV, Yu. A., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "Extraction of metal chelate compounds as affected by the nature of the solvent" (Section C.2 - 11 Aug 61, morning)

BAGRASHKINA, Kh. S., and KHOLIN, Yu. V., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Some Aspects of Energy Transfer in Radiation Chemistry" (Section A.1, Session II - 7 Aug 61, morning)

BELYAYEVSKIY, Yu. A., Institute of General and Inorganic Chemistry, Academy of Sciences UkSSR, Kiev - "The Kinetics of the Electrode Processes in the Electrolysis of Melted Salts" (Section B.3 - 10 Aug 61, morning)

BELYAYEVSKIY, Yu. E., [illegible], and KOPA, K. N. (Possibly KOPA, E. N.), Institute of General and Inorganic Chemistry, Academy of Sciences UkSSR, Kiev - "Electrochemical experiment with melted borate and phosphate" (Section A.3, c, (2), Session I - 11 Aug 61, morning)

BELYAYEVSKIY, Yu. K., PAVLENKO, I. D., and SHTEMA, G. V., Institute of General and Inorganic Chemistry, Academy of Sciences UkSSR, Kiev - "On the correction diffusion in melted salts" (Section B.3 - 9 Aug 61, afternoon)

GRIGOROV, M. I., Moscow State University imeni M. V. Lomonosov, (Co-Chairman, Section A.3,c,(2), Session I(B), 11 Aug 61, afternoon)

GRIGOROV, O. N., LAVRENT'YEV, V. I., KUDRYAVTSEV, P. A., and KOCHETKOVA, T. N., Moscow State University imeni M. V. Lomonosov - "On thermodynamic properties of columbium and cerium oxides" (Section A.3,c,(1), Session II(A), 11 Aug 61, morning)

GOL'DANSKIY, V. I., Institute of Chemical Physics, Academy of Sciences USSR - "Two-proton radioactivity - a new kind of radioactive decay of nuclei" (Section A.1 - 7 Aug 61, morning)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K.; ANDREYEVA, V.N.

Galvanic concentration cells in fused phosphates. Part 2: Leand and bismuth oxides in fused sodium metaphosphate. Ukr. khim. zhur. 27 no.2:167-170 '61. (MIRA 14:3)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
(Electromotive force) (Lead oxide) (Bismuth oxide)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K., [Delimars'kyi, IU.K.] akademik; ANDREYEVA, V.N. [Andrieieva, V.N.]; KAPTSOVA, T.N.

Interaction of metal oxides with fused sodium metaphosphate. Dop. AN URSR no.4:492-494 '62. (MIRA 15:5)

1. Institut obshchey i neorganicheskoy khimii AN USSR.
2. AN USSR (for Delimarskiy).
(Metallic oxides) (Sodium metaphosphates)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Conditioned inhibition to a system of conditioned stimuli in dogs.
Trudy Inst.fiziol. no.2:16-30 '53. (MLRA 7:5)

1. Laboratoriya fiziologii i patologii vysshey nervnoy deyatel'nosti (zaveduyushchiy - F.P.Mayorov). (Conditioned response) (Inhibition)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Works of Russian researchers on the physiology of digestion published prior to 1890. Fiziol. zhur. 41 no.3:433-446 My-Je '55. (MLRA 8:8)

1. Kabinet istorii otechestvennoy fiziologii Instituta fiziologii im. I.P. Pavlova AN SSSR

(GASTROINTESTINAL SYSTEM, physiology, distestion, hist. of research in Russia in 19th century review & bibliog.)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Effect of proloned use of caffeine on conditioned inhibition in response to conditioned stimuli. Trudy Inst. fiziol. 6:150-161 '57. (MIRA 11:4)

1. Laboratoriya fiziologii i patologii vysshey nervnoy deyatel'nosti (zaveduyushchiy F.P. Mayorov).
(CAFFEINE) (CONDITIONED RESPONSE)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.; FEDOROVA-GROT, A.K.

In memory of Daniil Il'ich Soloveichik; 25th anniversary of his death. Zhur.vys.nerv.deiat. 6 no.3:494-497 My-Je '56. (MLRA 9:11)

1. Kabinet istorii otechestvennoy fiziologii Instituta fiziologii im. I.P.Pavlova Akademii nauk SSSR.
(SOLOVEICHIK, DANIIL IL'ICH, 1885-1931)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.; FEDOROVA-GROT, A.K.

Pavel Pavlovich Pimenov, 1873-1956; obituary. Zhur.vys.nerv.deait. 7 no.3:460-462 My-Je '57. (MIRA 10:10)

1. Kabinet istorii otechestvennoy fiziologii Instituta fiziologii im. I.P.Pavlova AN SSSR.
(PIMENOV, PAVEL PAVLOVICH, 1873-1956)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N., kand.biol.nauk

Survey of the development of Russian research on the physiology of gastric digestion in the 19th century (till 1890). Trudy Inst. ist. est. i tekh. 24:284-300 '58. (MIRA 11:8)

(STOMACH--SECRETIONS) (BIOLOGICAL RESEARCH)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Historical sketch on the development of Russian investigations on the physiology of digestion in the oral cavity in the nineteenth century (up to 1890). Trudy Inst. fiziol. 9:461-466 '60.
(MIRA 14:3)

1. Kabinet istorii otechestvennoy fiziologii (zaveduyushchaya - V.N.Andreyeva) Instituta fiziologii im. I.P.Pavlova.
(DIGESTION)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Interaction of conditioned food and devensive reflexes. Nauch. soob. Inst. fiziol. AN SSSR no.1:13-15 '59. (MIRA 14:10)

1. Laboratoriya fiziologii i patologii vysshey nervnoy deyatel'nosti (zav. - F.P.Mayorov) Instituta fiziologii imeni Pavlova AN SSSR.
(CONDITIONED RESPONSE)

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

I.P.Pavlov in S.P.Botkin's therapeutic clinic at the Academy (1878-1890). Fiziol. zhur. 46 no.3:363-366 Mr '60. (MIRA 14:7)

1. From the I.P.Pavlov Institute of Physiology, the U.S.S.R. Academy of Sciences, Leningrad.
(PAVLOV, IVAN PETROVICH, 1849-1936)
(BOTKIN, SERGEI PETROVICH, 1832-1889)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Ivan Petrovich Pavlov as dissertation examiner. Trudy Inst. ist. est. i tekh. 41:294-323 '61. (MIRA 15:2)

1. Kabinet istorii fiziologii Instituta fiziologii AN SSSR. (Pavlov, Ivan Petrovich, 1849-1936)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

[illegible]lem of correlation between the extinctive and supraliminal inhibitions. Zhur. vys. nerv. deiat. 12 no.4:679-685 Jl-Ap '62. (MIRA 17:11)

1. Laboratory of Physiology and Pathology of Higher Nervous Activity, Pavlov Institute of Physiology, U.S.S.R. Academy of Sciences, Leningrad.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.N.

Interaction of supraliminal and external inhibition. Zhur. vys. nerv. deiat. 14 no. 4:695-700 Jl-Ag '64. (MIRA 17:12)

1. Laboratory of Physiology and Experimental Pathology of Higher Nervous Activity, Pavlov Institute of Physiology, U.S.S.R. Academy of Sciences, Leningrad.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

DELIMARSKIY, Yu.K.; ANDREYEVA, V.N.; [illegible]

Reaction of metal oxides with fused sodium metaphosphate. Izv. AN SSSR. Neorg. mat. 1 no.1:150-155 Ja '65. (MIRA 18:5)

1. Kiyevskiy tekhnologicheskiy institut pishchevoy promyshlennosti.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

KRATIN, Yu.G.; ANDREYEVA, V.N.

Variations in the action of differentiation signals in conditioned motor alimentary reflexes in cats. Zhur. vys. nerv. deiat. 16 no. 1: 3-13 Ja-F '66 (MIRA 19:2)

1. Laboratoriya fiziologii i patologii vysshey nervnoy deyatel'nosti Instituta fiziologii imeni I.P. Pavlova AN SSSR. Submitted December 14, 1964.

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

L 44356-66 EWT(m)/EWP(k)/EWP(t)/ETI IJP(c) JH/JD/HW

ACC NR: AP6013482 SOURCE CODE: UR/0182/65/000/012/0020/0023

54
B

AUTHOR: Lisitsyn, V. D.; Andreyeva, V. N.; Tyanutov, A. G.

ORG: none

TITLE: Experimental study of the drawing of box shapes

SOURCE: Kuznechno-shtampovochnoye proizvodstvo, no. 12, 1965, 20-23

TOPIC TAGS: rimmed steel, brass, oscillograph, metal drawing, pressure measurement, metal press / 10kp rimmed steel, L62 brass, AD aluminum, MPO-2 oscillograph

ABSTRACT: The article presents the results of an experimental investigation of the drawing of box shapes of various materials: 10kp rimmed steel, L62 brass and AD aluminum, performed with the object of determining the drawing pressure and blankholder pressure as a function of punch stroke and time. The experiments were carried out in an industrial 65-ton drawing press on recording the stresses and pressures with the aid of wire strain gauges and an MPO-2 oscillograph. Analysis of the obtained oscillograms made it possible to determine the maximum drawing pressures for various drawing coefficients m_ϵ as well as the blankholder and edge-trimming pressures. As exemplified by the drawing of brass boxes (Fig. 1), during

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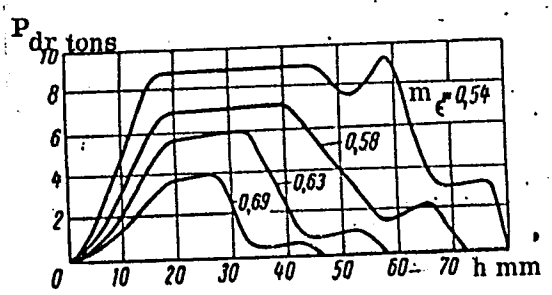

Fig. 1. Experimental curves of drawing pressure P_{dr} during the drawing of brass boxes

the initial part of the forming process the curves of drawing pressure rise steeply; this corresponds to the period of travel of the punch from its initial position to a position at which the centers of curvature of the punch and die coincide in the horizontal. The variation in kinematic and dynamic parameters in the course of the drawing of box shapes was analyzed by plotting combined curves of drawing pressure, blankholder pressure, punch travel and punch stroke (Fig. 2). Initially, as the draw punch encounters the blank, the continuity of motion of the press slider gets disturbed and its velocity sharply decreases. At the moment of impact of the punch

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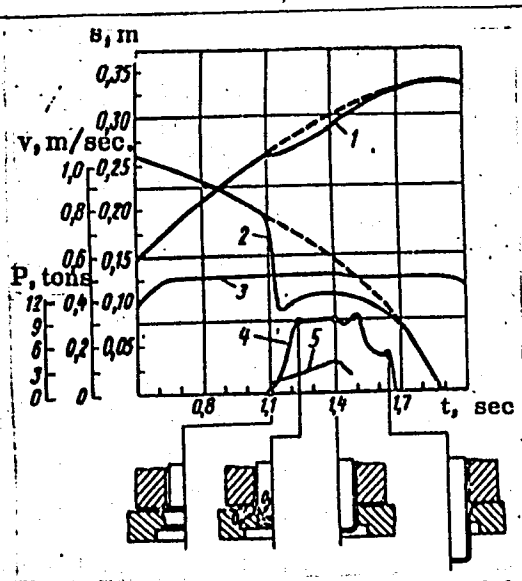

Fig. 2. Combined curves of variation in kinematic and dynamic parameters during the drawing of box shapes:
1 - punch travel; 2 - punch velocity; 3 - blankholder travel; 4 - drawing pressure; 5 - blankholder pressure

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SOV/68-58-10-13/25

AUTHORS: Yastrzhem'skaya, O.V., ~~Andreyeva, V.S.~~, Nenich, V.N., Royter, M.K., Drinfel'd, P.Ye., and Bilym, L.M.

TITLE: From Experience of Putting the Indene-coumarone Resin Plant on the Kadiyevka Coking Works into Operation (Opyt puska i raboty tsekha inden-kumaronovykh smol na Kadiyevskom koksokhimicheskom zavode)

PERIODICAL: Koks i Khimiya, 1958, Nr 10, pp 40 - 44 (USSR)

ABSTRACT: The plant was put into operation in 1955. The scheme of the operation of the plant as designed is shown in Figure 1 and changes introduced are shown in Figures 2 and 3. Aluminium chloride is used as a catalyst in a proportion of 0.35% of the raw material. The polymerisation process begins at 20 - 30 °C and is finished at 110 °C. The main difficulties were encountered in the distillation plant due to the incorrect design of the evaporators and due to an excessive corrosion of the condenser. All resin pipe-lines were found to be too long and complicated. Cooling drums for resin were insufficient. The initial losses of hydrocarbons amounted to 18-20% and were reduced (by unspecified methods) to

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From Experience of Putting the Indene-coumarone Resin Plant on the Kadiyevka Coking Works into Operation

6-8%. Softening temperature of the resin produced 100 - 110 °C. It is pointed out that in order to decrease corrosion, an enamelled distillation apparatus and a reactor for the preparation of aluminium chloride complex should be introduced. There are 3 figures.

ASSOCIATIONS: UKhIN and Kadiyevskiy koksokhimicheskiy zavod (Kadiyevka Coking Works)

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S/068/62/000/003/002/003
E071/E435

AUTHORS: Nosalevich, I.M., Yeru, I.I., Yastrzhembskaya, O.V., Andreyeva, V.S.

TITLE: The production of lightly coloured and light resistant indine-coumarone resins by the method of catalytic hydrogenation

PERIODICAL: Koks i khimiya, no.3, 1962, 44-46

TEXT: The work was carried out in order to determine the possibility of production of light coloured, stable and light-resistant indine-coumarone resins, similar to good quality resins produced in other countries. The following types of catalyst were tested: an industrial tungsten nickel sulphide on alumina (tablets), molybdenum trisulphide (powder) and nickel-chromium oxide (tablets). The hydrogenation was done in two types of autoclaves: a) with a stirrer, 350 rpm, b) by rotating about the horizontal axis at 75 rpm. As a starting material an industrial product of catalysis containing 44 to 48% resin and about 0.25% sulphur was used. Catalysts were added in the form of a fine powder in an amount of 10 wt %. The hydrogenation product was

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filtered and steam distilled. The colour of industrial resins is usually determined by the iodine scale but the colour of the hydrogenated product was so much improved that the iodine scale could not be used and instead the chromate scale was applied. In addition, the iodine numbers of the starting (54 to 56) and the finished product (25 to 30) were determined. The resistance to light was determined by irradiation for 6 hours with ultraviolet light. It was found that with the sulphide catalyst at 200 to 250°C, the initial hydrogen pressure could be reduced to 30 to 40 atm without noticeable effect on the colour of the finished product. The colour of the starting product - 35 units of the iodine scale; finished product - 0.5 units of the chromate scale. A decrease of the duration of heating from 60 to 30 min also had no influence on the quality of the product; further decrease to 10 minutes brings about a noticeable deterioration. Replacement of hydrogen by coke-oven gas brings about some increase in the coloration of the resins. Experiments carried out in a rotating autoclave gave somewhat better results for both hydrogen and coke-oven gas, this is explained by the effect of hydrogenation in a

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S/068/62/000/005/001/002
E071/E435

AUTHORS: Yastrzhembskaya, O.V., Andreyeva, V.S.

TITLE: Application of boron fluoride in the production of indine-coumarone resins

PERIODICAL: Koks i khimiya, no.5, 1962, 44-46

TEXT: The results are described of experimental polymerization of indine-coumarone fraction (heavy benzoles) in the presence of phenol, acetic, alcohol and ether complexes of boron trifluoride carried out in UKhIN. It was found that the application of phenol ($BF_3 \cdot 2C_6H_5OH$) and acetic ($BF_3 \cdot 2CH_3COOH$) complexes produces resin with a coloration below 7 units of the iodine scale. An increase of the polymerization temperature up to 100 - 120°C has no influence on the colour of resins. The best results were obtained on polymerization in the presence of 0.5% (on the starting indine coumarone fraction) of the phenol complex and temperature of 35 to 100°C. In this case the maximum yield of 52.4% was obtained, while the corresponding yield with the acetic complex was 44.7% (under standard experimental conditions). In view of the high

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S/081/62/000/023/091/120
B101/B186

AUTHORS: Nosalevich, I. M., Yastrzhembskaya, O. V., Andreyeva, V. S., Shapoval, L. D.

TITLE: Development of coumarone-indene resins production in the Ukraine

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 23, 1962, 678, abstract 23P95 (Sb. nauchn. tr. Ukr. n.-i. uglekhim. in-t., no. 13 (35), 1962, 136 - 143)

TEXT:: The method of producing coumarone-indene resins (CIR) was improved so as to obtain neutral, bright, and light-resistant materials with a low-ash content. Continuous operation was introduced. The finished complex is separated in a settler-type supercentrifuge. The polymerizate is stabilized by hydrogenation. New types of catalysts (BF_3 complexes) are used. A description of the techniques, a flow sheet of the apparatus for continuous CIR production, and flow sheets showing the hydrogenation of the polymerizate and the separation of resins are given. [Abstracter's note: Complete translation.]

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ANVAYER, S. I;ANDREYEVA, V. S;ZAK, N. N;MOROZOV, V. M.

Treatment of chronic alcoholism with thiurm. Zh. nevropat. psikhiat., Moskva 52 no.4:58-61 Apr 1952. (CLML 22:2)

1. Of the Central Institute of Psychiatry of the Ministry of Public Health RSFSR (Director -- Docent D. Ye. Melekhov) and of the Clinical Psychiatric Hospital imeni Gannushkin (Head Physician -- V. N. Rybalko).

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.S.

Effect of sodium fluoride on the calcium and organic and inorganic phosphorus content of blood serum in puppies [with summary in English]. Fiziol.zhur. 43 no.12:1183-1186 D '57. (MIRA 11:3)

1. Kafedra gospital'noy pediatrii Meditsinskogo instituta, Sverdlovsk.
(FLUORIDES, effects,
sodium, on blood calcium & phosphorus in young dogs (Rus))
(CALCIUM, in blood,
eff. of sodium fluoride in young dogs (Rus))
(PHOSPHORUS, in blood,
same)

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V. S., Candidate Med Sci (diss) -- "Some clinical and biochemical data on preschool children suffering from dental fluorosis in the fluorosis-endemic areas of the Urals". Sverdlovsk, 1958. 18 pp (Sverdlovsk State Med Inst), 200 copies (KL, No 25, 1959, 139)

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.S.

Effect of an excess of fluorine on the growing body. Fel'd. i akush. 23 no.7:3-5 Jl '58 (MIRA 11:8)
(FLUORINE--PHYSIOLOGICAL EFFECT)

APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5"

"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.S.

Some biochemical changes in children's blood during dental fluorosis. Vop.okh.mat.i det. 4 no.6:25-29 N-D '59. (MIRA 13:4)

1. Iz kafedry gospital'noy pediatrii (zaveduyushchiy - doktor med. nauk D.Ye. Sheynberg) Sverdlovskogo meditsinskogo instituta (direktor - prof. A.F. Zverev).
(FLUORINE--TOXICOLOGY) (BLOOD)

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ANDREYEVA, V.S.; GAVRILOVA, L.V.; LEVIN, V.M.; RESHETNIKOVA, Zh.V.

Acute psychotic states during antabuse treatment of chronic alcoholism. Zhur.nev. i psikh. 59 no.6:674-678 '59. (MIRA 13:1)

1. Bol'nitsa imeni Gannushkina (glavnyy vrach V.N. Rybalka) i kafedra psikhiatrii (zav. - prof. A.V. Snezhnevskiy) TSentral'nogo instituta usovershenstvovaniya vrachey, Moskva.
(DISULFIRAM, inj. eff.
psychoses (Rus))
(PSYCHOSES, etiol. & pathogne.
disulfiram (Rus))

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ANDREYEVA, V.S.

Investigation of the amount of calcium in the urine by Sul'kovich's method for the early detection of intoxication during the treatment of children with increased doses of mitamin D_2. Lab.delo 6 no.6: 54-56 N-D '60. (MIRA 13:11)

1. Kafedra gospital'noy pediatrii (zav. - doktor meditsinskikh nauk D.Ye.Sheynberg) Sverdlovskogo meditsinskogo instituta (dir. - prof. A.F.Zverev)
(CALCIUM IN THE BODY)
(VITAMINS--D)

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On treatment

ANDREYEVA, V. S., CAND MED SCI, "~~TREATING~~ CHRONIC ALCOHOLISM WITH THIURAM (ANTABUSE)." MOSCOW, 1961. (SECOND MOSCOW STATE MED INST IM N. I. PIROGOV). (KL, 3-61, 229).

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

ANDREYEVA, V.S. (Moskva)

Characteristics of remissions in chronic alcoholism following a course of antabuse treatment. Trudy Gos. nauch.-issl. inst. psikh. 38:355-359 '63 (MIRA 16:11)

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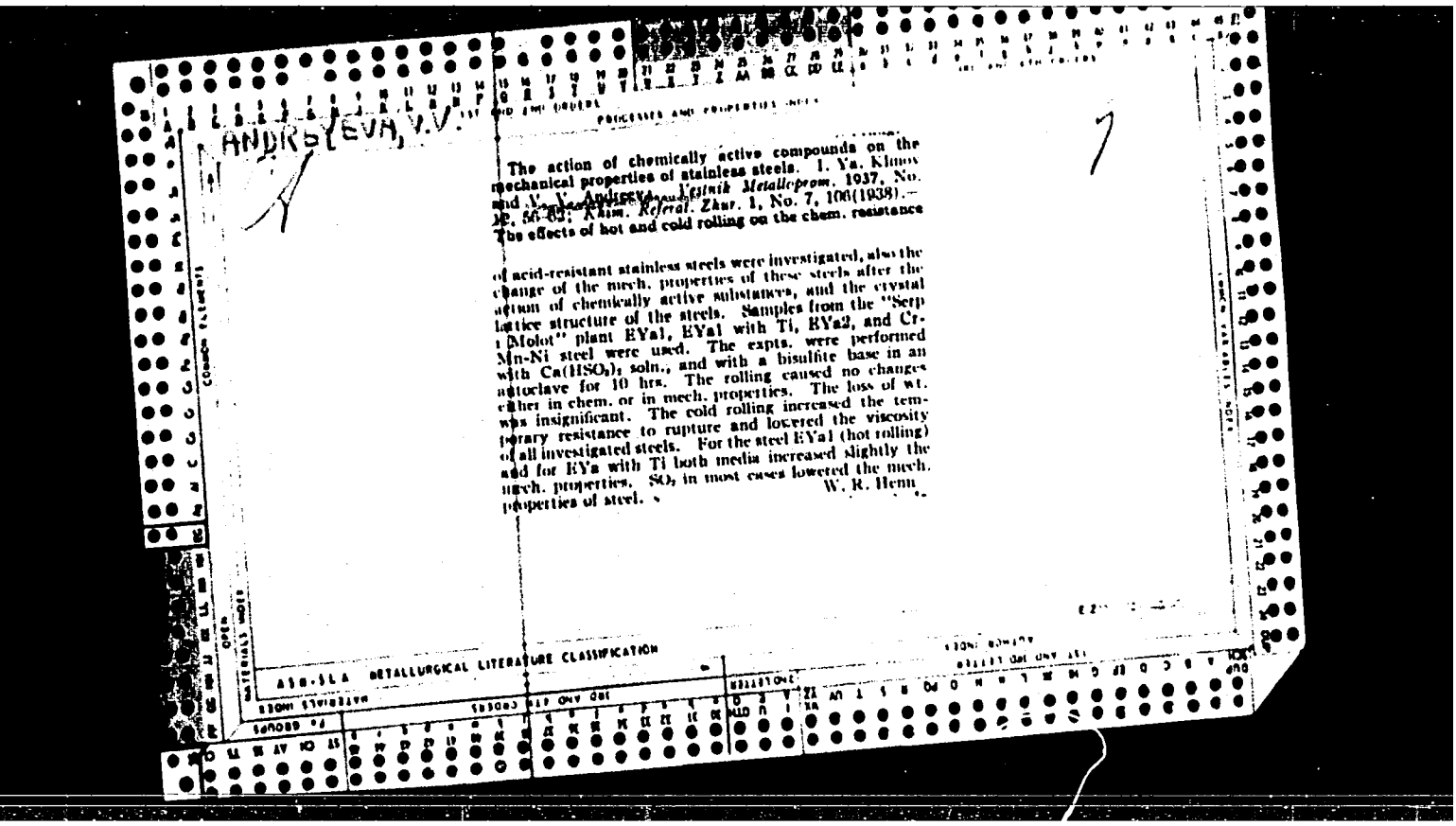

ANDREYEVA, V.V.

The action of chemically active compounds on the mechanical properties of stainless steels. I. Ya. Klinov and V. V. Andreyeva. *Vestnik Metalloprom.* 1937, No. 12, 56-62; *Khim. Referat. Zhur.* 1, No. 7, 106(1938).—The effects of hot and cold rolling on the chem. resistance of acid-resistant stainless steels were investigated, also the change of the mech. properties of these steels after the action of chemically active substances, and the crystal lattice structure of the steels. Samples from the "Serp i Molot" plant EYa1, EYa1 with Ti, EYa2, and Cr-Mn-Ni steel were used. The expts. were performed with $Ca(HSO_3)_2$ soln., and with a bisulfite base in an autoclave for 10 hrs. The rolling caused no changes either in chem. or in mech. properties. The loss of wt. was insignificant. The cold rolling increased the temporary resistance to rupture and lowered the viscosity of all investigated steels. For the steel EYa1 (hot rolling) and for EYa with Ti both media increased slightly the mech. properties. SO_2 in most cases lowered the mech. properties of steel.

W. R. Henn

A38-51A METALLURGICAL LITERATURE CLASSIFICATION

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S/080/62/035/006/002/013
D204/D307

AUTHORS: Andreyeva, V. V. and Alkeseyeva, Ye. L.

TITLE: The oxidation of titanium, zirconium, molybdenum and certain alloys.

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 6, 1962, 1175-1183

TEXT: The rates of oxidation of massive Ti, Mo, Zr, 90Ti10Mo and 92Ti5Cr3Al were studied in oxygen and in air, between 20 and 400°C. Progress of oxidation was assessed by the thickness of oxide scale formed, as measured by an optical polarization method. At room temperature, in air, Ti oxidized logarithmically, the scale reaching a thickness of 80 - 90 A.V. after 545 days. Between 50 and 250°C Ti oxidized faster in dry than in humid air. The oxidation of Zr was already appreciable at 50°C, of Ti and 90Ti10Mo alloy at 100°C and of Mo and 92Ti5Cr3Al at 150°C. At 150°C the scales on Ti, Mo and Zr reached 30 - 50 A.V. after 6 hours and were 250 - 400 A.V. thick after 6 hours at 250 - 350°C. Zirconium

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D204/D307

The oxidation of titanium ...

oxidized more rapidly than Mo at 250°C or than Ti at 350°C. This was associated with the growth of monoclinic ZrO_2. Mo oxidized rapidly above 300°C but an admixture of 10% Mo and Ti made this alloy better than Ti alone at the same temperature. The TiCrAl alloy was particularly resistant to oxidation. In general the metals oxidized logarithmically at lower and parabolically at higher temperatures. The rate of oxidation is thought to be governed initially by the rate of formation of a thin scale as the temperature is increased. The scales were found to be rutile for Ti, cubic ZrO_2 up to 2500C and monoclinic ZrO_2 above 250°C for Zr, MoO_3 up to 300°C and MoO_3 + MoO_2 above 300°C for Mo, solid solution of TiO_2 and MoO_3 for 90Ti10Mo and (probably) a solid solution of Ti, Cr, Al oxides for the ternary alloy. Energies of activation for the oxidation processes ranged from 10 to 21.2 kcal/mole between 200 and 350°C. The results are discussed. There are 8 figures and 2 tables.

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3509h

S/080/62/035/003/011/024
D217/D302

18.1272

AUTHORS: Glukhova, A. I. and Andreyeva, V. V.

TITLE: Influence of additions of oxidizing agents to hydrochloric acid solutions on the corrosion and electrochemical behavior of zirconium and on alloys of the system zirconium-titanium

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 3, 1962,567-572

TEXT: Alloys of the system Zr-Ti were prepared from the metal iodides; the hafnium content of zirconium did not exceed 0.04%. The alloys were cast into a water-cooled copper crucible in an electric arc furnace, with a tungsten electrode, and were then forged at 800°C. The alloys were prepared and their mechanical properties tested in the laboratory under the supervision of A. A. Kiselev. The investigation of the influence of additions of oxidizing agents to HCl solutions on the corrosion and electrochemical behavior of Zr has shown that the potential at which passivation is destroyed depends on the ratio between chlorine-ion content and ions of the

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Influence of additions ... S/080/62/035/003/011/024
D217/D302

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry AS USSR)

SUBMITTED: March 20, 1961

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35693

S/080/62/035/003/010/024
D217/D302

18.1272

AUTHORS: Andreyeva, V. V. and Glukhova, A. I.

TITLE: Corrosion and electrochemical behavior of alloys of the system zirconium-titanium in hydrochloric acid solutions

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, n. 3, 1962, 562-567

TEXT: The purpose of this investigation, in which the corrosion resistance and the electrochemical properties of binary alloys of the system Zr-Ti, as well as unalloyed Zr and Ti were studied in HCl solution, was to establish general relationships between the behavior of these metals and alloys and a number of factors (alloy composition, concentration and temperature of solution and electrochemical polarization) and to develop new corrosion-resistant alloys. Various concentrations of HCl solution at 20, 40 and 100°C were used in this study. It was found that whereas zirconium remains practically unattacked by HCl up to 100°C at all concentrations, the rate of corrosion of Ti increases considerably with in-

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crease in acid concentration and temperature. Polarization curves, obtained by the potentiostatic method, show that the cathodic regions of titanium readily dissolve in 20% HCl solution at 100°C. Passivation commences at a potential of -0.3 V (on the hydrogen scale). The anodic regions of Ti are passive. For Zr, a passive portion is observed in the anodic region at 40°C. However, at a potential of +0.3 V, the current density increases abruptly and pitting corrosion commences. On increasing the temperature to 100°C, the passive range in the anodic region decreases and at a potential of +0.2 V, the metal becomes active; the corrosion current increases and Zr is completely destroyed. The shape of the polarization curves changes with the nature of the metal and composition of the alloy. The results obtained support the assumption that the composition of the protective surface films of Zr-Ti alloys is a solid solution of mixed oxides, consisting of ZrO_2 and TiO_2. It is concluded that alloying Ti with Zr increases its corrosion resistance in HCl solutions. The higher the Zr content, the higher the stability of the alloy. There are 5 figures, 2 tables and 8 references: 5 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language

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31048
S/598/61/000/006/030/034
D217/D303

18.6300

AUTHORS: Andreyeva, V.V., and Kazarin, V.I.

TITLE: Corrosion resistance and electrochemical properties of titanium and its alloys

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy, no. 6, 1961. Metallotermiya i elektrokhimiya titana, 230 - 236

TEXT: 98.7 % pure Ti and binary Ti alloys with additions of Mo and Zr were studied in solutions of various acids. Apart from the corrosion method, the electrochemical potentiostatic method of plotting polarization curves was used. The latter method enabled the corrosion behavior of metal to be studied at a desired potential, maintained at a constant value by means of an electronic potentiostat. The following relationships were studied for Ti: C.D. against potential and corrosion against potential in 40 % H_2SO_4, 40 % H_2SO_4 + 5 % HNO_3, and 40 % H_2SO_4 + 5 % HNO_3 + 0.1 % NaF. The influence of Zr and Mo content on the rate of corrosion of Ti in

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31040

S/598/61/000/006/030/034
Corrosion resistance and electrochemical.. D217/D303

H_2SO_4 solutions of various concentrations at various temperatures was investigated. Curves of C.D. against potential and corrosion against potential were plotted for Ti-Mo alloys in H_2SO_4 at 100°. The dependence of the critical anode current density on temperature and composition of Ti-Zr alloys in 40 % H_2SO_4 was investigated. The range of potentials within which Ti is passive, i.e. remains practically uncorroded in most agressive acid solutions, except solutions containing F ions, was defined. Titanium when alloyed with Zr and Mo results in materials of high mechanical properties and corrosion resistance. There are 6 figures and 6 references: 3 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: N.P. Inglis and J.B. Cotton, Corrosion, Prevention and Control, 1958, 5, no. 11, 49; M. Stern, J. of the Electrochemical Soc., 1958, 105, 11, 638 - 647.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

S/762/61/000/000/007/029

AUTHORS: Andreyeva, V.V., Kazarin, V.I.

TITLE: Corrosion resistance of titanium and its alloys.

SOURCE: Titan v promyshlennosti; sbornik statey. Ed. by S.G.Glazunov. Moscow, 1961, 90-97.

TEXT: The paper comprises a state-of-the-art survey based on published literature. Ti and its alloys may serve usefully in chemical-equipment construction. In some aggressive media the stability of Ti compares with that of Pt. Ti excels over stainless steel by greater resistance against pitting, corrosion cracking, and fatigue corrosion (in chloride solutions etc.). In large structures it may be applied as a 1-2-mm thick cladding material. The corrosion resistance of Ti is attributed to the formation of a protective surface film, the composition of which depends on the conditions of its formation and exposure (cf. the authors, in Akad. nauk SSSR, Dokl., no.4, 1957, 56-159; v.121, no.5, 1958, 873-876; v.123, no.6, 1958, 1048-1051). The film consists prevalently of TiO_2; at times, in HCl, it may consist of TiH_2; within a certain concentration range in H_2SO_4, it may be formed of variously constituted insoluble compounds of TiO_2, H_2SO_4, and H_2O. In solutions containing F ions, H_2SO_4, and HCl (except for highly diluted low-temperature solutions), oxalic acid, etc., Ti is unstable. Passivity may then be attained by anodization (Tomashov, N.D., et al., Protection of Ti in H_2SO_4 and HCl by anodization. Fil. VINITI, 1959, tema (paper) no.13, no. M-59-239/26) and by adsorption,

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Corrosion resistance of titanium and its alloys. S/762/61/000/000/007/029

followed by partial chemosorption, of cations such as Cu^{2+} et al. (cf. Stern, M., J. Electrochem. Soc., v. 105, no. 11, 1958, 638-647; Roger, W., Leidheiser, H., Z. f. Elektrochemie, v. 62, no. 6/7, 1958, 619-830). The authors have shown that the protective effect is due to the presence of a certain quantity of Ti^{4+} ions in the H_2SO_4 and HCl which established an equilibrium with the TiO_2 of the surface film. The authors have shown, by the potentiostatic method and otherwise, that the presence of oxidizers, such as HNO_3, H_2O_2, O_2 (aeration), $KMnO_4$, et al., produces an oxidizing-reducing potential at which the Ti is passive (potentiostatic curves are depicted and interpreted in detail). Lastly, corrosion resistance through the formation of surface films may be achieved by suitable alloying (composition and characteristics are tabulated and graphed). Most effective additions: Mo, Zr, Nb. The significant favorable effect of a small (1.4%) addition of Al to a Ti+3%Mo alloys is noted. Basically, the alloying addition must be a metal which per se is more corrosion-resistant in the given aggressive medium than Ti alone. It must be capable of forming a protective surface film by solid-solution formation between the oxides of Ti and of the alloying addition. A most effective corrosion-protective improvement on Ti alloys is achieved by heat treatments which produce single-phase alloys with a wholly recrystallized structure. There are 5 figures, 6 tables, and 6 references (4 Russian-language Soviet, 1 German, 1 English-language).

ASSOCIATION: None given.

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PHASE I BOOK EXPLOITATION SOV/5956

Andreyeva, V. V., and V. I. Kazarin.

Novyye konstruktsionnyye khimicheski stoykiye metallicheskiye materialy (New, Chemically Stable Structural Metal Materials) Moscow, Goskhimizdat, 1961. 189 p. (Korroziya v khimicheskikh proizvodstvakh i sposoby zashchity, vyp. 17) 6000 copies printed.

Ed. (Title page): I. Ya. Klinov; Editorial Board of Series: N. A. Baklanov, I. Ya. Klinov, A. L. Labutin, G. V. Sigalayev (Chairman), P. D. Trebukov (Secretary), and P. G. Udyma; Ed.: S. M. Belen'kaya; Tech. Ed.: V. V. Kogan.

PURPOSE: This book is intended for technical personnel of chemical plants.

COVERAGE: The book reviews the properties and methods of producing the new, chemically stable structural materials (titanium-base alloys and zirconium-base alloys) currently being used. Materials which may see wide use in the future due to their valuable properties

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5(4)
AUTHORS: Andreyeva, V. V., Kazarin, V. I. SOV/20-123-6-25/50

TITLE: The Influence of the Ions of Quadrivalent Titanium Upon the Electrochemical Properties and the Corrosion Behavior of Titanium (Vliyaniye ionov chetyrekhvalentnogo titana na elektrokhimicheskiye svoystva i korrozionnoye povedeniye titana)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 6, pp 1048-1051 (USSR)

ABSTRACT: The present paper deals with the problem as to wether an increase of the superficial film in thickness increases the corrosion stability of titanium or not. The thickness of the film formed on the titanium surface during polishing cannot be measured optically since the initial values of the optical constants of a surface of pure titanium are not known. In the present case, only the increase in thickness of the already present film could be investigated. Within 180 days, the thickness of the film increased only by 17 - 22 Å. This increase is not mainly due to an increase of the film in thickness, but, apparently, to the diminishing of the defects in the lattice of titanium oxide. It is possible that there is an equilibrium state in which practically no corrosion of

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titanium is observed. The equilibrium condition has the form $TiO_2 + 2H_2SO_4 \rightleftarrows Ti(SO_4)_2 + 2H_2O$ or $TiO_2 + 4H^+ \rightleftarrows Ti^{4+} + 2H_2O$, that is $[Ti^{4+}] / [H^+]^4 = K$. The investigations were carried out in solutions of hydrochloric acid and of sulphuric acid. According to the results obtained, the amount of Ti^{4+} necessary for the maintaining of titanium in the passive state, depends on the acid concentration and on the temperature of the solution. A diagram shows the dependence of the corrosion rate of titanium on the concentration of Ti^{4+} in 20% and in 36% solutions of hydrochloric acid and in 40% solution of sulphuric acid. The second diagram shows the dependence of the rate of corrosion of titanium in a 40% solution of H_2SO_4 on the concentration of Ti^{4+} and on the temperature of the solutions. In a 40% solution of sulphuric acid at 20° and at 60°, 0.015 mol/l Ti^{4+} are sufficient for keeping titanium in the passive state. If the temperature of the solution increases to 100°, already 0.1 mol/l of Ti^{4+} would be necessary. In solutions of

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hydrochloric acid, a still higher concentration of Ti^{4+} would be necessary because of the higher solubility of TiO_2 .

Measurement of electrode potential time dependence while the titanium sample is submerged in a 40% sulphuric acid solution shows progressive titanium activation. In such a solution at room temperature, the dissolution of titanium begins approximately after 2 hours. According to the polarization curves of titanium in a 40% solution of sulphuric acid in the presence of 0.14 mol/l Ti^{4+} at 40° and 60°, hydrogen is generated after activation. Titanium is initially dissolved as a bivalent ion. If the solution contains an oxidizer (for example, dissolved oxygen) the reaction $Ti^{2+} - e \rightarrow Ti^{3+} - e \rightarrow Ti^{4+}$ occurs. The

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The Influence of the Ions of Quadrivalent Titanium SOV/20-123-6-25/50
Upon the Electrochemical Properties and the Corrosion Behavior of Titanium

oxidation of titanium to Ti^{4+} is by far slower than that to Ti^{3+}. There are 4 figures and 8 references, 3 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR
(Institute of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: July 25, 1958, by A. N. Frumkin, Academician

SUBMITTED: July 21, 1958

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

5(4)

AUTHORS: Andreyeva, V. V., Kazarin, V. I. SOV/20-121-5-30/50

TITLE: The Electrochemical Properties and the Corrosion Behavior of Titanium in Solutions of Sulfuric Acid (Elektrokhimicheskiye svoystva i korrozionnoye povedeniye titana v rastvorakh sernoy kisloty)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 5, pp 873 - 876 (USSR)

ABSTRACT: The velocity of dissolution of titanium in solutions of sulphuric acid depends in a very complicated manner on the concentration of this solution. There are 2 maxima of the velocity of solution of titanium; one of them corresponds to a 40% concentration, the other - to a 75% concentration. The low velocity of the dissolution of titanium in diluted solutions of sulfuric acid (first minimum) implies a protecting influence of the natural oxide film developed on the titanium surface by the action of the air. In the region 50-70% of H_2SO_4 concentration, the velocity of the corrosion of

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titanium does not vary if the temperature increases from 30° to 50°, the losses of titanium are slightly higher. The investigation of the system $TiO_2.SO_3.H_2O$ proves the possibility of the formation of 2 compounds of TiO_2 with H_2SO_4, the solubility of which at 100° is extraordinarily low for concentrations of 50-70%. These compounds have the following composition: $TiOSO_4.H_2O$ and $Ti_2O(SO_4)_3.5H_2O$ with the ratios $TiO_2:SO_3:H_2O$ = 1:1:1 for the first compound and 2:3:5 for the second compound. This was also confirmed by an experiment in which the variation of the potential in a 60% solution of H_2SO_4 was measured as a time function. In those sulfuric acid solutions which correspond to the maxima and minima of the solution velocity of titanium, the electrode potentials have different values. This implies a different character of the reactions on the surface electrode. The activation energy of the ionization of the metal

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The Electrochemical Properties and the Corrosion Behavior of Titanium in Solutions of Sulfuric Acid

SOV/2o-121-5-3o/5o

has the value 16,7 kcal/mol. The polarization curves of the anode and of the cathode have horizontal parts which correspond to an intensive solution of the metal. The generation of oxygen on the titanium surface begins at a sufficiently high overvoltage, i.e. ~ + 2V. Numerous further experimental data are given in this paper. There are 4 figures and 4 references, 3 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry, AS USSR)

PRESENTED: April 10, 1958, by A.N.Frumkin, Academician

SUBMITTED: April 10, 1958

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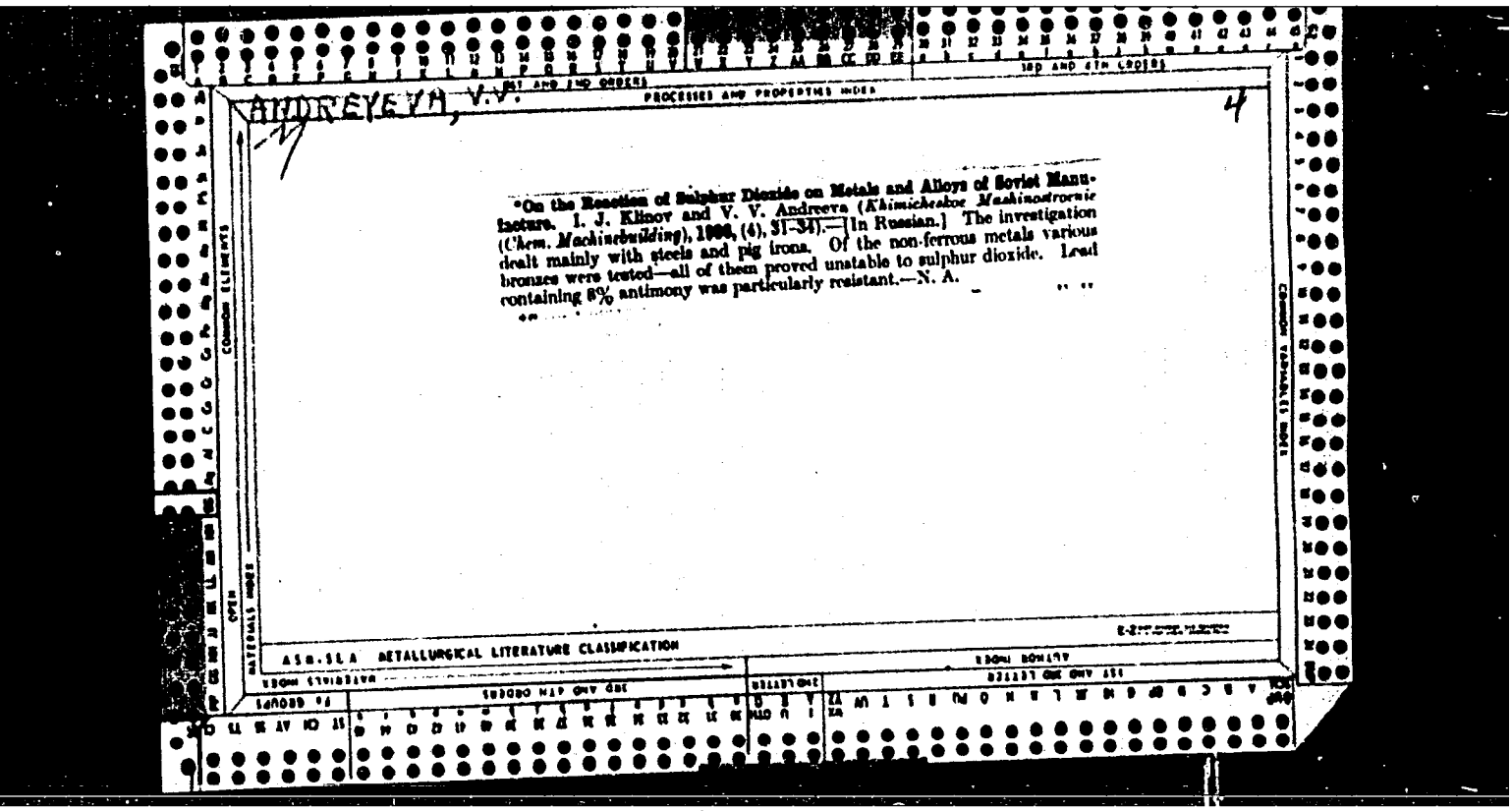
ANDREYEVA, V.V.

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4

*On the Reaction of Sulphur Dioxide on Metals and Alloys of Soviet Manufacture. I. J. Klinov and V. V. Andreeva (*Khimicheskoe Mashinostroenie* (*Chem. Machinebuilding*), 1936, (6), 31-34).—[In Russian.] The investigation dealt mainly with steels and pig irons. Of the non-ferrous metals various bronzes were tested—all of them proved unstable to sulphur dioxide. Lead containing 8% antimony was particularly resistant.—N. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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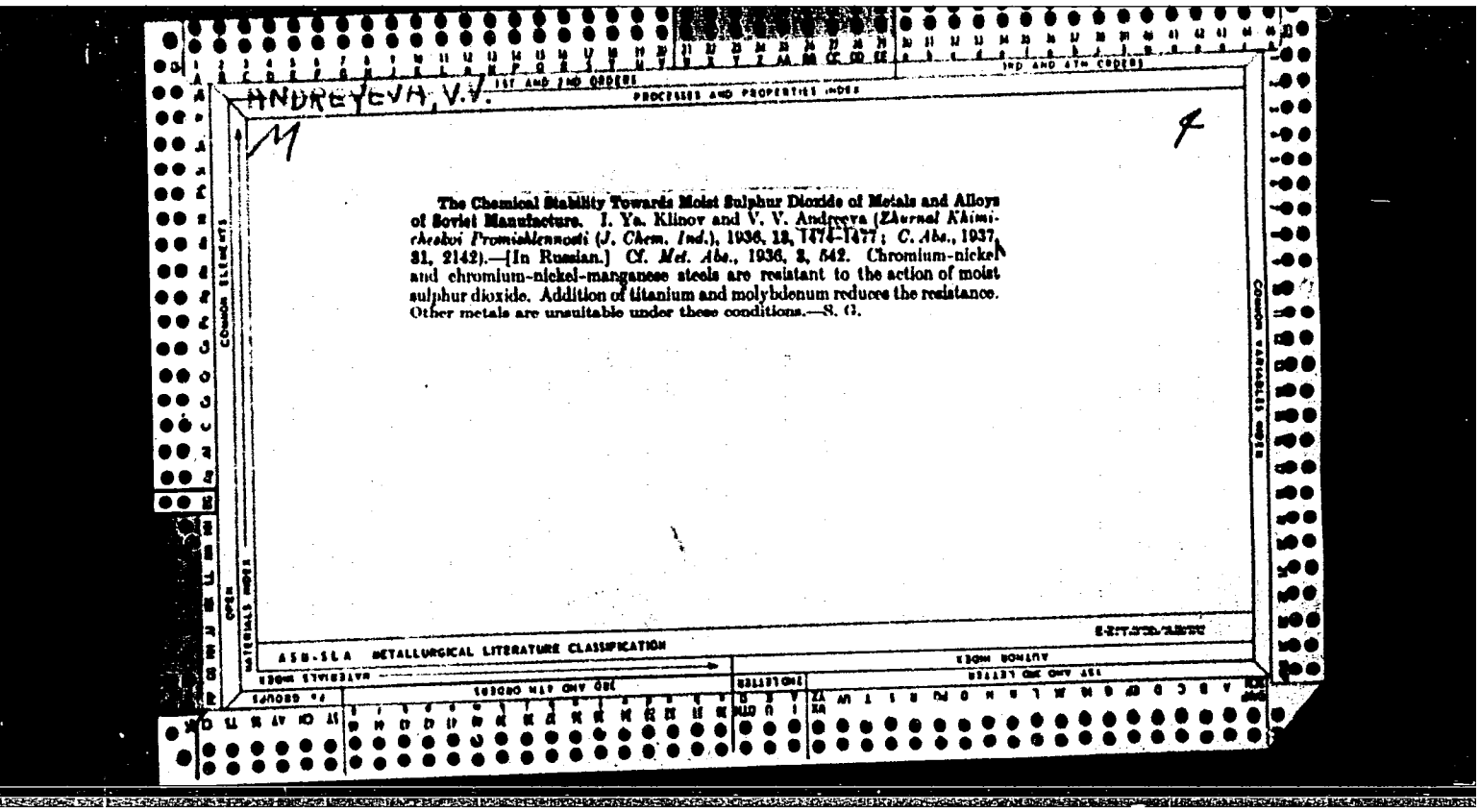
ANDREYEVA, V.V.

The Chemical Stability Towards Moist Sulphur Dioxide of Metals and Alloys of Soviet Manufacture. I. Ya. Klinov and V. V. Andreeva (*Zhurnal Khimicheskoi Promishlennosti* (*J. Chem. Ind.*), 1936, 13, 1474–1477; *C. Abs.*, 1937, 31, 2142).—[In Russian.] Cf. *Met. Abs.*, 1936, 3, 542. Chromium-nickel and chromium-nickel-manganese steels are resistant to the action of moist sulphur dioxide. Addition of titanium and molybdenum reduces the resistance. Other metals are unsuitable under these conditions.—S. G.

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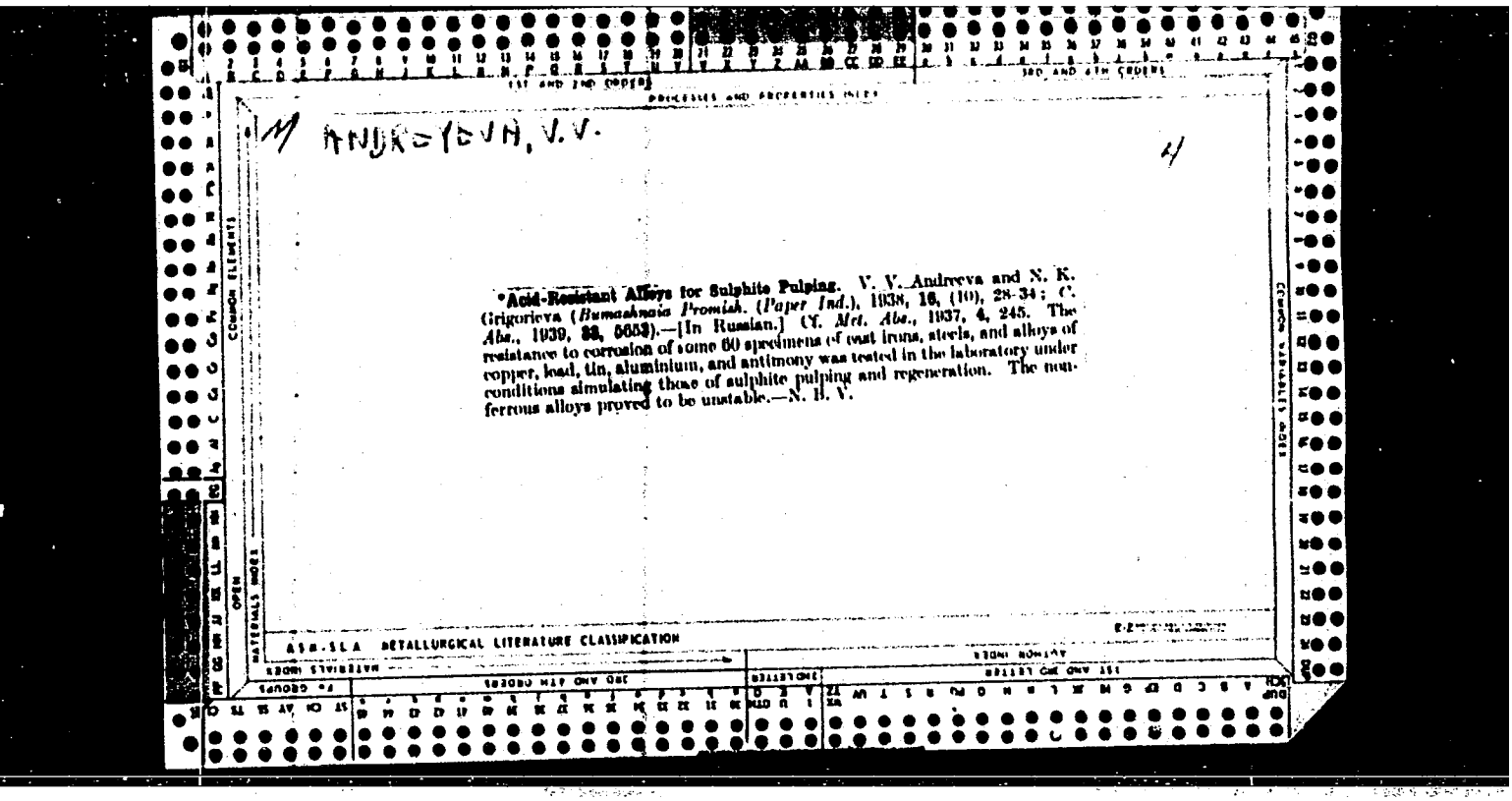

M ANDREEVA, V.V.

4

•**Acid-Resistant Alloys for Sulphite Pulping.** V. V. Andreeva and N. K. Grigorieva (*Bumazhnaia Promish.* (*Paper Ind.*), 1938, 16, (10), 28-34; *C. Abs.*, 1939, **33**, 5053).—[In Russian.] Cf. *Met. Abs.*, 1937, 4, 245. The resistance to corrosion of some 60 specimens of cast irons, steels, and alloys of copper, lead, tin, aluminium, and antimony was tested in the laboratory under conditions simulating those of sulphite pulping and regeneration. The non-ferrous alloys proved to be unstable.—N. B. V.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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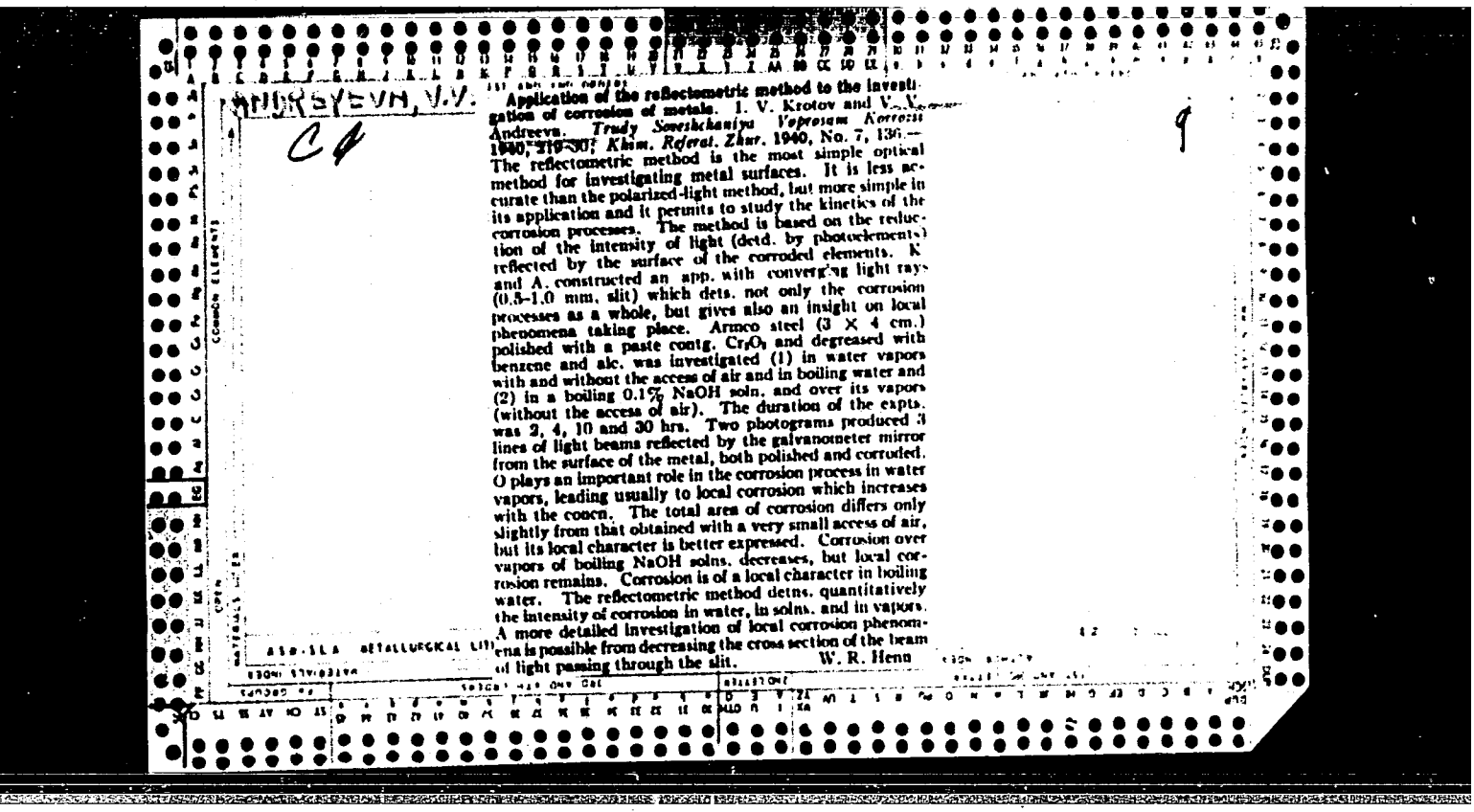

KROTOV, V.V.

C4

9

Application of the reflectometric method to the investigation of corrosion of metals. I. V. Krotov and V. V. Andreeva. *Trudy Soveshchaniya Voprosam Korrozii* 1940, 219–30; *Khim. Referat. Zhur.* 1940, No. 7, 136.—The reflectometric method is the most simple optical method for investigating metal surfaces. It is less accurate than the polarized-light method, but more simple in its application and it permits to study the kinetics of the corrosion processes. The method is based on the reduction of the intensity of light (detd. by photoelements) reflected by the surface of the corroded elements. K. and A. constructed an app. with converging light rays (0.5–1.0 mm. slit) which dets. not only the corrosion processes as a whole, but gives also an insight on local phenomena taking place. Armco steel (3 × 4 cm.) polished with a paste contg. Cr_2O_3 and degreased with benzene and alc. was investigated (1) in water vapors with and without the access of air and in boiling water and (2) in a boiling 0.1% NaOH soln. and over its vapors (without the access of air). The duration of the expts. was 2, 4, 10 and 30 hrs. Two photograms produced 3 lines of light beams reflected by the galvanometer mirror from the surface of the metal, both polished and corroded. O plays an important role in the corrosion process in water vapors, leading usually to local corrosion which increases with the concn. The total area of corrosion differs only slightly from that obtained with a very small access of air, but its local character is better expressed. Corrosion over vapors of boiling NaOH solns. decreases, but local corrosion remains. Corrosion is of a local character in boiling water. The reflectometric method dets. quantitatively the intensity of corrosion in water, in solns. and in vapors. A more detailed investigation of local corrosion phenomena is possible from decreasing the cross section of the beam of light passing through the slit. W. R. Henn

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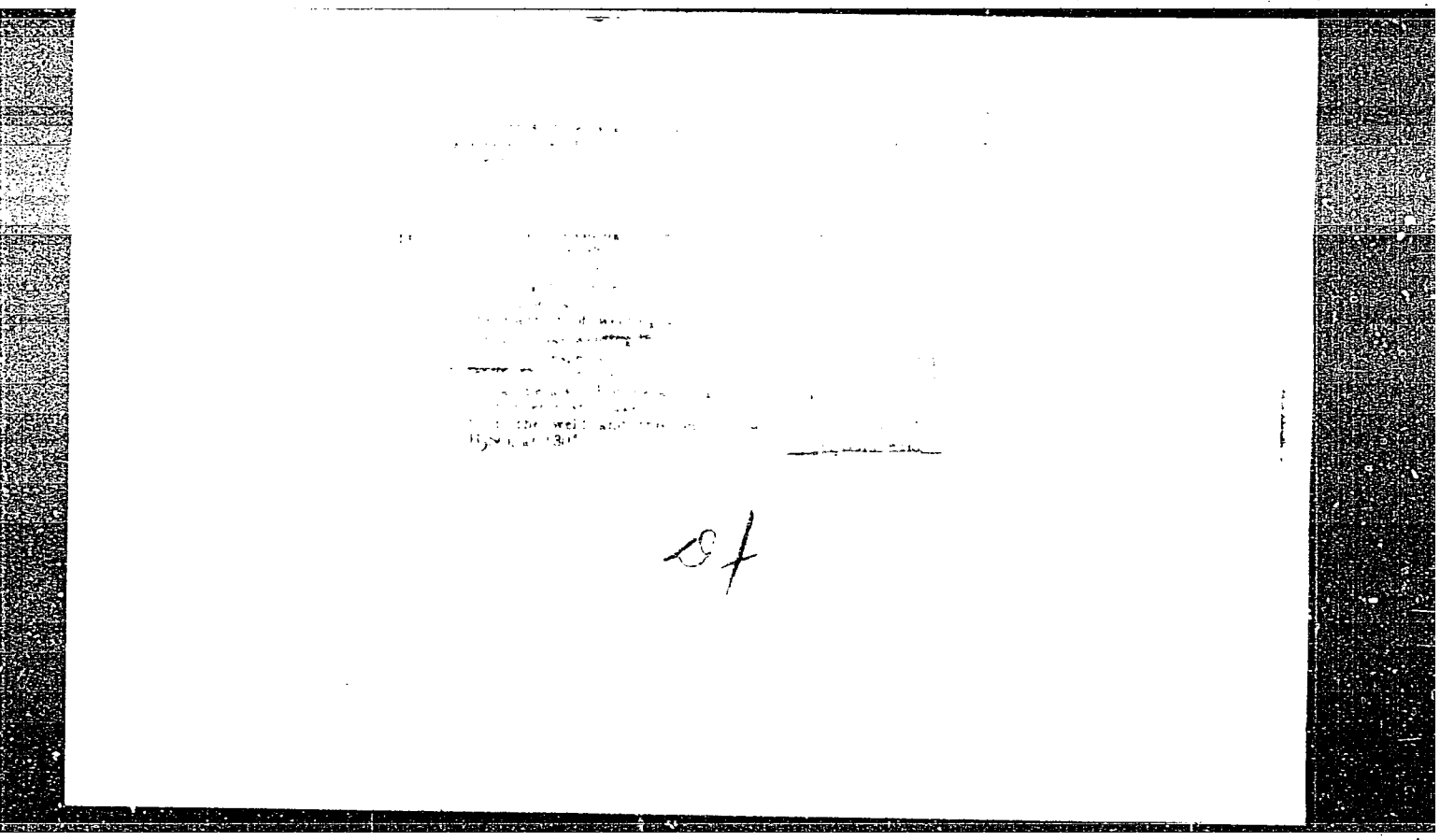

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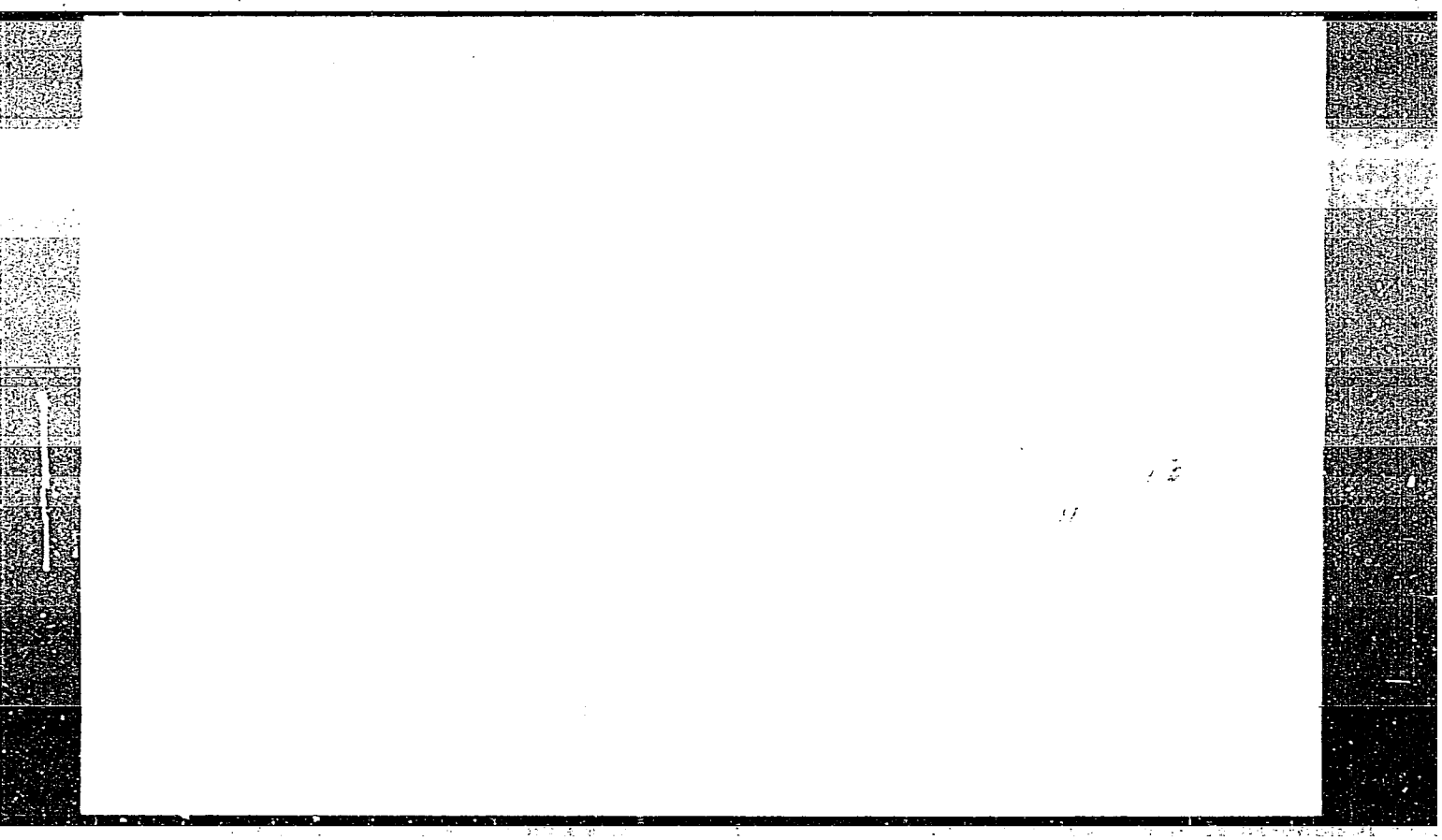

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SOV/137-58-9-19451

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 187 (USSR)

AUTHOR: Andreyeva, V.V.

TITLE: Measurement of the Thickness of Thin Films on Metals by the Optical Polarization Method (Izmereniye tolshchin tonkikh plenok na metallakh opticheskim polyarizatsionnym metodom)

PERIODICAL: Tr. In-ta fiz. khimii AN SSSR, 1957, Nr 6, pp 79-98

ABSTRACT: The experiment of the application of the optical-polarization Drude-Tronstad method for the study of the corrosion process and the passivation of metals is described. The method permits the measurement of very fine films (F), of the order of 2-300 angstrom, without disrupting their continuity and while conducting other, for example, electrochemical, measurements at the same time. It is shown that the oxide F forming on Fe in dry air at 25°C and atmospheric pressure when measured directly following the introduction of air into a vacuum container, has a thickness of the order of 10-19 angstrom. After staying under the same conditions for 24 hours the thickness of F increases by 4-9 angstrom, but during the following 30 days its thickness does not vary. The maximum thickness

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Measurement of the Thickness of Thin Films on Metals (cont.)

of the F formed amounts to 16-23 angstrom. The thickness of F on specimens kept in a desiccatorfor three years remained within the limit of the same 16-23 angstrom. The growth of surface F on Ti and Al at 25° and 40% relative humidity practically ceases after 70-75 days reaching an ultimate thickness of 45-55 angstrom on Ti and 30-50 angstrom on Al. The oxide F on Cu after 140 days attains a thickness of 150 angstrom, and after being kept for three years in a desiccator it becomes visible in contrast to the invisible F on Ti and Al kept under the same conditions. The thickness of F on Ti and Al is the sum of the thicknesses of the F proper and of the polymolecular layer of adsorbed gas or of the mixture of gas and water (depending on the composition of the medium), while on the surface of Ag and Pt at room temperature F form not as the result of the chemical oxidation process, but owing to the physical adsorption of gases. Bibliography: 19 references.

P.S.

1. Thin films--Measurement 2. Iron oxides 3. Thin films--Testing equipment
4. Thin films--Test results

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ANDREYEVA, V. V. and KASANYIN, V. Y.

"Elektrochemische und Korrosionserscheinungen von Titan und Titanlegierungen." paper submitted for the Congress on Corrosion, Budapest, 24-30 Sept 1958.

Inst. of Physical Chem., Acad. Sci. USSR.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

AUTHORS: Andreyeva, V. V., Shishakov, N. A. SOV/76-32-7-35/45

TITLE: On the Thickness of Oxide Films on Some Metals as Shown by Data From Electron Diffraction and Optical Investigations (O tolshchine okisnykh plenok na nekotorykh metallakh po dannym elektronograficheskikh i opticheskikh issledovaniy)

PERIODICAL: Zhurnal fizicheskoy khimii, 1958, Vol 32, Nr 7, pp. 1671 - 1672 (USSR)

ABSTRACT: Based on the comparative investigations mentioned above it is assumed that a reversible polymolecular adsorption takes place at metal surfaces besides the monomolecular adsorption. In the electron diffraction determinations in vacuum a thickness of the layer of from 10 to 20 Å is found, while the optical measurements yield an almost twice as great value. In the first case, therefore, a partial evaporation of the film may have taken place, which in the second case is regarded as oxide film. In order to verify this assumption pertinent experiments were carried out and it was found that in aluminium electron diffraction measurements show a layer of aluminium and oxygen ions which is not thicker than 10 Å, while optical data in the case

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of an air contact of the aluminium surface show a thickness of 21 - 22 Å. In the first case it would thus be the oxide film which is dealt with, while in the second case the oxide film and the polymolecular layer are present, which probably consists of oxygen and water traces. In the case of a pressure drop to 10^{-7} torr the film thickness decreases to 9 Å. When atmospheric pressure is restored it increases reversibly. Similar observations were made with iron and titanium, while experiments with platinum and gold showed that at normal temperature only the adsorption layer is present which completely disappears in vacuum, so that no film layer may be found by electron diffraction methods. At raised temperatures oxide films were also found in vacuum and it is assumed that this is an adsorption layer of molecular oxygen. There are 1 table and 3 references, 3 of which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut fizicheskoy khimii, Moskva (Moscow, Institute of Physical Chemistry, AS USSR)

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On the Thickness of Oxide Films on Some Metals as Shown by Data From Electron Diffraction and Optical Investigations SOV/76-32-7-35/45

SUBMITTED: April 2, 1957

1. Oxide films--Physical properties 2. Oxide films--Measurement 3. Oxide films--Electron diffraction analysis 4. Oxide films --Optical analysis 5. Metals--Adsorptive properties

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ANDREYEVA, V V

1 /)

PHASE I BOOK EXPLOITATION SOV/3399

Shishakov, Nikolay Alekseyevich, Valentina Vladimirovna Andreyeva, and Nina Konstantinovna Andrushchenko

Stroyeniye i mekhanizm obrazovaniya okisnykh plenok na metallakh (Structure and Mechanism of Formation of Oxide Films on Metals) Moscow, AN SSSR, 1959. 194 p. Errata slip inserted. 2,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut fizicheskoy khimii

Resp. Ed.: V.I. Kasatochkin, Doctor of Chemical Sciences; Ed. of Publishing House: A.A. Babad-Zakhryapin; Tech. Ed.: V.V. Bruzgul'.

PURPOSE: The book is intended for students and workers in the field of metallography, particularly those interested in the study of the structure of the surface of metals and the mechanism of their interaction with oxygen.

COVERAGE: Having analyzed the various existing theories on the structure of oxide films on metals, the authors arrived at the conclusion that all existing theories were inadequate and had to be supplemented with new experimental data.

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The main purpose of the book is therefore the systematization of experimental data in this field. Basically, the work presents the investigation of the interaction of metals and pure oxygen or air. Considerable attention has been given to the investigation of the surface of the metal itself, since this knowledge is the prerequisite for a correct understanding of the mechanism of oxide film formation on metal surfaces. Included are 57 tables and 17 photographs. There are 132 references, of which 49 are Soviet.

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"APPROVED FOR RELEASE: 03/20/2001 CIA-RDP86-00513R000101410009-5

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ANDREYEVA, V. V.

Third prize (imeni D. K. Chernov) awarded to Engineer V. V. Andreyeva and Engineer V. I. Kazarin (Institute of Physical Chemistry, Ac. Sc., USSR), Engineer G. P. Danilova and Engineer Ye. A. Kamenskaya (Institute of Rare Metals) for their paper "Investigation of the Strength of Titanium Base, Corrosion Resistant Alloys".

Results of the 1958 Competition for Obtaining imeni D. K. Chernov and imeni N. A. Minkevich Prizes, Metallovedeniye i termicheskaya obrabotka metallov, 1959, No. 6, pp 62-64

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5(4),18(7)

AUTHORS: Andreyeva, V. V., Kazarin, V. I. SOV/20-128-4-31/65

TITLE: The Influence of Alloy Elements on the Corrosion Resistance and Electrochemical Behavior of Titanium

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 4, pp 748-751 (USSR)

ABSTRACT: The corrosion resistance (CR) of titanium alloys was described by the authors in earlier papers (Refs 1-9). The influence of the following elements on the CR of titanium in acids had been investigated: Cu, Zr, Nb, Mo, Ta, V, Al, Cr, Fe, Ni, Mn, Si, and B. These elements can be divided into 3 groups: (1) Elements raising the CR of Ti (Mo, Ta, Al, Zr, V); (2) elements causing no change in the CR (Si), and (3) elements reducing the CR (Fe, Mn). Figure 1 shows that the elements of the 1st group act already in additions between 1 and 2.5%. A further increase in the addition raises the CR achieved only slightly except for Zr which, in an addition of 50%, makes the CR in H_2SO_4 and HCl equal to that of pure Zr. Figure 2 shows the curves of anodic and cathodic polarization of Ti and its alloys with 10% Nb, Ta, Mo. For Ti + 10% Ta, the anodic

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current density exhibits the lowest value. Figure 4 shows the corrosion of alloys with 10% Mo, Nb, Ta. There is a linear dependence between the logarithm of the corrosion rate and $\frac{1}{T}$. On the basis of the semiconductor theory for corrosion-protective films (Wagner, Refs 10-12, Hauffe, Refs 13-15), the distribution of oxygen ions and electrons in the defective spots of the lattice is discussed, and the following conclusion is drawn: The addition of a metal with higher valency than that of titanium reduces the defective spots available for O-ions by the appearance of an additional number of free electrons, thus raising the CR of Ti. The opposite phenomenon occurs when a metal of lower valency than that of Ti is added. There are 4 figures and 20 references, 10 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

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SUBMITTED: April 15, 1959

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Vsesoyuznoye soveshchaniye po splavam redkikh metallov. 1st, Moscow, 1957

Redkiye metally i splavy; trudy... (Rare Metals and Alloys; Transactions of the First All-Union Conference on Rare-Metal Alloys) Moscow, Metallurgizdat, 1960. 436 p. 3,150 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut metallurgii; Komitet po redkim metallam pri nauchno-tekhnicheskom komitete.

Ed.: I.I. Shaposhnikov; Ed. of Publishing House: O.N. Ivanyutina; Tech. Ed.: P.G. Yelkostyuva.

PURPOSE: This collection of articles is intended for metallurgical engineers, physicists, and workers in the machine-building and radio-engineering industries. It may also be used by students of schools of higher education.

COVERAGE: The collection contains technical papers which were presented and discussed at the First All-Union Conference on Rare-Metal Alloys, held in the Institute of Metallurgy, Academy of Sciences USSR in November 1957. Results of investigations of rare-metal alloys, titanium and copper-base alloys with additions of rare metals are presented and discussed along with investigations of rhenium, vanadium, niobium, and their alloys. The effect of rare-earth metals on properties of magnesium alloys and steels is analyzed. The uses of rhenium as a dehydrating catalyst, electroplating material, and metal suitable for making plugs for automobile electrical systems are discussed. Also, the effect of the addition of certain elements on the properties of heat-resistant steel is examined and alloys with special physical properties (particularly semiconductive alloys) are discussed. No personalities are mentioned. Soviet and non-Soviet references accompany some of the articles.

PART II. TITANIUM AND COPPER-BASE ALLOYS WITH RARE-METAL ADDITIONS

Rare Metals (Cont.) SOV/4164

Andreyeva, V.F., A.I. Glukhova, Ye.A. Lisenkova, L.I. Sviridova, and M.V. Yel'yan. Corrosion Resistance of Zirconium and Its Alloys 156

PART IV. RARE-EARTH METALS AND THEIR EFFECT ON PROPERTIES OF MAGNESIUM ALLOYS

Bykhovskiy, B.V., and Ye.S. Solyanenko. Rare-Earth Elements and Possibilities of Producing Them 171

Ioffe, I.M., V.M. Berezin, and L.M. Pelegrin. Production of Alumino-Cerium, Alumino-Lanthanum, Magnesium-Cerium, Magnesium-Lanthanum, and Magnesium-Neodymium Addition Alloys by Electrolysis 180

Serebren, V.P., and I.N. Serditskiy. Investigation of Physicochemical Interaction of Rare-Earth Metals With Magnesium, Iron, Chromium, and Titanium 189

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A109/A029

AUTHORS: Klinov, I.Ya., Professor, Doctor of Technical Sciences; Andreyeva, V.V., Candidate of Chemical Sciences

TITLE: Titanium and Its Alloys as Construction Materials

PERIODICAL: Khimicheskoye Mashinostroyeniye, 1960, No. 4, pp. 5 - 8

TEXT: The article reviews the results of tests carried out by M.A. Vorob'-yeva on the suitability of titanium and its alloys for construction purposes. Their mechanical properties depend on the content of oxygen, nitrate and nitrogen which increase their hardness and fatigue strength while reducing their plastic properties. The best plastic properties were observed in titanium obtained by the iodine method. The fatigue stress of BT1 (VT1) titanium decreases from 60 to 23 kg/mm^2 at 400°C and the yield strength from 47 to 19 kg/mm^2 at 400°C. Low temperatures increase the fatigue stress and reduce the plasticity of titanium. Although the electrode potential of titanium is negative, its surface is purified by oxygen which renders the potential positive. This is probably due to the formation of a protective TiO_2 coating. During corrosion in hydrochloric acid, titanium is sometimes covered by a protective TiH_2 coating. Sulfuric acid

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Titanium and Its Alloys as Construction Materials

produces insoluble compounds of TiO_2 with H_2SO_4, and nitric acid produces H_2TiO_3 coating. Both coatings protect the metal from acids. From the economic point of view the use of titanium is feasible when high corrosion resistance under continuous operating conditions is required and when no corrosive impurities are admitted. Pure titanium rather than its alloys should be used whenever it is considered sufficiently corrosion-resistant and when no additional alloying is required. Figure 2 shows results of corrosion tests carried out on four types of titanium in 50%-sulfuric acid at 50°C. The influence of admixtures on the corrosion rate of titanium in 63%-nitric acid at 50°C is shown in Figure 3. The corrosion rate can be reduced to zero by addition of HNO_3, $K_2Cr_2O_7$, $KMnO_4$, HNO_3 and H_2O_2 oxidizers or other compounds. These admixtures raise the titanium solution potential to a higher value than the Flade potential. Passivation can also be obtained by addition of Cu^{2+}, Fe^{3+}, Pt^{4+}, Pd^{4+}, Au^{3+}, etc. Titanium is suitable for construction of chemical machinery provided that the passivation has been achieved by formation of a protective coating and that the corrosion is not accelerated by changing operating conditions. Dry gaseous chlorine effects strong corrosion of titanium. In reaction with dry chlorine an inflammation of chloride may result. The presence of as little as 0.005% of moisture inhibits corrosion. At 100°C the corrosion rate of titanium in moist chlorine does not

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Titanium and Its Alloys as Construction Materials

exceed 0.0025 mm/year. Titanium retains its resistance in many organic solutions in which 18-8 nickel-chromium steels corrode. It is quickly corroding in boiling citric acid and in oxalic acid. Corrosion resistance and mechanical properties can be greatly improved by alloying with metals of higher corrosion resistance. The time effect on corrosion of cast titanium and titanium-based alloys in a 1 N sulfuric acid solution at 50°C was studied. The highest corrosion resistance was found in titanium-nickel alloys. Variation of corrosion rate depending on the content of molybdenum and the concentration and temperature of sulfuric acid was investigated. The highest corrosion resistance was achieved by addition of Mo, Ta, Nb, Zr and Cu. Titanium can be used either as basic material or for plating. In the latter case care should be taken that linear expansion coefficients do not differ too strongly from each other as this may lead to deformation or even destruction of the plating. In view of this, titanium can be recommended for plating of carbon and stainless steels. There are 9 figures, 1 table and 2 Soviet references.

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B004/B060

AUTHORS: Andreyeva, V. V., Alekseyeva, Ye. A.

TITLE: Thin Oxide Films on Titanium, Zirconium, Molybdenum and Titanium Alloys

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 1, pp. 106 - 109

TEXT: The authors wanted to study the kinetics of the oxidation of Ti, Zr, Mo, and the alloys Ti+10% Mo and Ti+3% Al+5% Cr in the temperature range 50-400°C. The thickness of the thin, invisible oxide films was measured by means of a previously described (Refs. 1,4,5) optical polarization method which is based on the ellipticity of reflected light. The oxidation took place in a tubular furnace in an oxygen stream. The thickness of the oxide films was measured every 60 min. Figs. 1,2 show the results of measurement; Table 1 lists the film thicknesses attained after 6 h. Zirconium is noticeably oxidized already at 50°C, titanium and the alloy Ti+10%Mo at 100°C, molybdenum and the alloy Ti+3%Al+5%Cr at 150°C. The oxidation is fast at the beginning, and gradually stops

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as soon as the oxide film attains a certain thickness. The increase in film thickness, L, can be represented by equation (1): $L = k \log(k_1 t + k_2)$. At high temperatures, however, the relation (2) $L^2 = k_3 t$ (Fig. 3) holds.

For the metals and alloys examined, Table 1 supplies the temperature ranges in which the logarithmic or the parabolic law holds. Up to 800°C, the oxide film on titanium consists of TiO_2 (rutile). TiO layers are formed above 800°C (immediately on the metal), Ti_2O_3 (middle layer) and TiO_2 (external layer). On zirconium, ZrO_2 of a cubic structure forms up to 250°C, and ZrO_2 of a monoclinic structure above 250°C. In the case of molybdenum, the oxide layer consists of MoO_3 up to 300°C. Above 300°C, MoO_2 is formed additionally due to dissociation. Fig. 3 further shows oxidation curves for chromium and aluminum, which are taken from the paper by T. N. Krylova (Ref. 9). These metals form only Cr_2O_3 and Al_2O_3, respectively. The activation energy was calculated from the slope of the linear function $\log k = f(1/T)$ (Table 1). The mechanism underlying

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Thin Oxide Films on Titanium, Zirconium, Molybdenum, and Titanium Alloys

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the oxidation of zirconium and molybdenum differs from that of the oxidation of titanium and the alloy Ti+10%Mo. A mixed oxide, $TiO_2 + xMoO_3$, is formed in the latter case. The resistivity to heat is thus improved. The high resistivity of the alloy Ti+3%Al+5%Cr to oxidation is explained by the formation of a mixed oxide of the spinel type. Fig. 4 shows the oxidation of titanium at 50-250°C in dry and moist, fully saturated air. In dry air, the oxide layer becomes twice as thick as in moist air. In the latter, however, the oxide layer is more compact and contains fewer defects. At 250°C, the water binding is loosened, and the thickness of the oxide layer attains the same value as in dry air. There are 4 figures, 1 table, and 12 references: 9 Soviet, 2 US, and 1 German.

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A054/A033

AUTHORS: Pakhaluyev, K.M., Medvedeva, I.V., Andreyeva, V.V., and Kul'kova, M.N.

TITLE: Oxidation and Decarbonization of Steels in Heating Furnaces Fired With Natural Gas

PERIODICAL: Stal', 1961, No. 2, pp. 160-163

TEXT: At the zavod "Krasnyy oktyabr" ("Krasnyy octyabre" Plant) and the VNIIMT it was found that the average metal losses due to cindering amount to 2.16-2.77% of the charge weight for 6-ton ingots and to 1.36-1.88% for blooms and slabs, when heating furnaces fired with masut or natural gas are used. In order to study the processes of cindering and decarbonization and to find ways to reduce these processes simultaneously, 7 steel grades were investigated under complete and incomplete combustion of natural gas. The tests were carried out on specimens (rolled bars) 50 mm in diameter and 200 mm long. The decarbonized surface layer of the samples was removed and

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Oxidation and Decarbonization of Steels in Heating Furnaces Fired With Natural Gas

the surface was polished. Delayed cooling of the specimens was effected by fitting to one of the furnace openings a brick-lined chamber, into which technically pure nitrogen was blown. The furnace was fired with Saushinsk natural gas (CO_2: 0.25%; O_2: 0.20%; CH_4: 97.90%; C_mH_n: 0.17%; N_2: 1.48%). When the degree of oxidation of the specimen was determined, they were held in the furnace for a given time until a constant temperature was reached, then they were quickly removed and cooled in water. When both oxidation and decarbonization were investigated the specimen was put after heating in the cooling chamber filled with nitrogen. Besides, the samples were pickled (in 20%-hydrochloric acid at 45-60°C) weighed and measured. The difference in weight of the samples before and after heating gave the amount of cinder; the depth of decarbonized layer was defined by microanalysis and the excess air in a ВТИ-(VTI)-type gas-analyzer. Altogether 82 tests were carried out with natural gas firing with excess air factors varying between 0.6 and 1.6. The samples were heated to 700-1250°C, the holding time at constant tempera-

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ture was 1/2-3 hours. The relationship between the amount of oxidized metal and the factor of excess air in the combustion products of natural gas is plotted in figs.1-2, showing that metal cinder quickly decreases with a reduction of the excess air factor when heating to 1000°C and more. If it is technologically possible to lower somewhat the very high temperatures of the metal during heat treatment, the metal losses due to cindering could be reduced considerably. Fig.4 shows that by cutting down the holding time as far as permitted by the technology, cindering can also be decreased. When the effect of air excess on decarbonization was studied, the decrease of the air excess factor was found to be accompanied by a thinner decarbonized layer. The lowering of the oxidizing effect of combustion products of natural gas were moreover observed to affect the metal and the carbon content of the metal simultaneously. It is, therefore, possible to reduce oxidation and decarbonization when heating under "non-oxidizing" conditions. From the test results it was concluded that the total excess of oxidants - as compared with the equivalent amount - quickly declines with a decreasing value of "a"; on

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Oxidation and Decarbonization of Steels in Heating Furnaces Fired With Natural Gas

an average the combustion products of gas lose their oxidizing effect at metal temperatures of 800, 1000, 1200°C (with an air excess factor of 0.54). Based on these data it is possible to attain a "non-oxidizing" heating of steel in natural-gas fired free flame furnaces. However, at very low "a" values the incomplete combustion results in a temperature decrease of the combustion products and additional heat with preheated fuel and air has to be supplied. The conditions of non-oxidizing heating for various furnaces (for instance for roller type furnaces for blooms) are determined by the following temperatures

	Bloom	Billet	Sheet
Temperature of the combustion product of the fuel, °C, ca	1400	1000	1050-1100
Calorimetric temperature of combustion, °C, ca	1870	1430	1500-1570
Temperature of air preheating, according to fig.9, °C	840	130-160	250-400

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